*Original Research*

# Prevalence of self-medication amidst COVID-19 pandemic in Bangladesh-an online survey

**Md. Firoz Mahmud, Mst Sabrina Moonajilin, Umme Motahara, Lakshmi Rani Kundu, Rakib Hossain**[*]

## ABSTRACT

**Background**: People's health is affected both adversely and favorably by self-medication, as demonstrated during the COVID-19 pandemic. The study's goal is to estimate the extent of self-medication among Bangladeshi people in the current COVID-19 scenario, as well as the factors that influence it. **Methods**: Between June 20th and July 20th, 2021, a cross-sectional online survey was conducted with 494 participants. The Mann-Whitney U test and Kruskal-Wallis test were used to compare behavioral preventative measures among demographic groups. Multivariable logistic regression was used to determine the variables that were linked to the usage of preventative medications and herbal products. **Results**: Among the participants, 58.5% were male, with 47% aged between 15-24. Most respondents (59.3%) were students, with 47% having at least an honors degree, and57.6% living in an urban area. A total of 85.4% of the population studied had no chronic disease. As part of behavioral preventive practices, 95.3% wore masks, 86.8% stayed home except for basic needs, 89.7% stayed away from crowded places, and 72.9% frequently washed their hands. Education level, occupation, residence, and being terrified about COVID-19 were significantly associated with differences in behavioral preventive practices (p<0.05). Some 67.8% of participants reported that they had no COVID-19-related symptoms. Among these participants, the most commonly used substances were Vitamin C (32.8%), Vitamin supplements (25.7%), Paracetamol (23%), Chloroquine (2.4%), and Fexo and Zinc. Education, residence, and being somewhat terrified about COVID-19 were significantly associated with taking preventive medicine (p-values: 0.03 and 0.22, 95% CI: 0.18-0.94 and 0.022-0.94 respectively). Urban participants (p=0.005, 95% CI: 0.28-0.80) and those a little bit terrified about COVID-19 (p=0.001, 95% CI: 0.15-0.63) were most likely to take preventive medicine. **Conclusion**: This study demonstrates that people frequently use herbal remedies and preventative medications without consulting doctors. While self-medication can be helpful in some circumstances, it must be carried out with caution.

**Key words:** self-medication, self-care, preventive medicine, preventive measure, COVID-19

*Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh*

**Correspondence**

**Rakib Hossain**, Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh

Email: rakib.stu20163@juniv.edu

Check for updates

**BioMedPress**
The Open Access Publisher

## INTRODUCTION

In December 2019, the first occurrence of a previously unknown coronavirus infection was discovered in Wuhan, China[1]. Due to its similarities to SARS-CoV, the novel virus was designated SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2), and the illness induced by the virus is Coronavirus Disease 2019 (COVID-19)[2]. The World Health Organization (WHO) declared the recent coronavirus (COVID-19) outbreak a global pandemic on March 11, 2020. The coronavirus COVID-19 has affected 220 countries and territories and has been confirmed in over 202,430,584 million people worldwide as of January 9, 2021, with over 4,290,728 million fatalities[3]. The COVID-19 outbreak has triggered a state of emergency in most parts of the world, leaving people with the notion that self-help, self-care, and self-medication are their only alternatives[4]. The World Health Organization (WHO) defines personal care as "What people do for themselves to establish and maintain health, prevent and deal with illness"[5]. Hygiene, diet, lifestyle, environmental factors, socioeconomic considerations, and self-medication are all aspects of self-care[6]. Self-medication is regarded as the use of drugs to treat self-examined illnesses or ailments, or the intermittent or continuous use of a prescription drug to treat incurable or recurring disorders or symptoms[7]. Self-medication is defined by the World Health Organization (WHO) as "the selection and use of medicines by individuals (or a member of the individual's family) to treat self-recognized or self-diagnosed conditions or symptoms"[8]. The prevalence of self-medication has been found to be influenced by age, educational status, family attitudes, medicine manufacturer advertising, enforcement of regulations governing the dispensing and sale of drugs, prior experiences with the symptoms or disease, the significance attributed to the dis-

ease, home-stocked prescription drugs, and respondents' financial situations[9]. COVID-19 is spread via droplets, aerosols, fomites, contact routes, and fecal inhalation[10]. The rapid spread of the disease prompted country lockdowns across the globe, prohibiting international travel and, in some cases, restricting trade[11]. This may have hampered the supply of medications in healthcare institutions and slowed mobility, preventing individuals from seeking medical help. Delayed access to healthcare centers, sociocultural beliefs, the relatively high cost of hospital treatment, previous experience of treatment for the same symptoms, easy availability of drugs, poor regulatory practice, and the urgency of feeling relieved, along with advice from friends and the media, are all common reasons for self-medication[12]. Self-medication is common for a variety of reasons, including delayed access to healthcare centers, sociocultural beliefs, the comparatively high cost of hospital treatment, previous treatments for almost the same symptoms, accessibility of drugs, poor regulatory practice, and the urgency of feeling relieved, as well as recommendations from friends and the media[8]. Fear of Covid-19 has been discovered to be one of the most significant factors associated with the adoption of behavioral preventive measures, as well as the use of prophylactic drugs and herbal products[13]. People use masks, avoid crowds, reduce smoking, and practice handwashing as behavioral preventive measures[14]. We can define this type of preventive measure as self-care. Many studies have revealed that vitamin and mineral supplements, fexo, ordain, zinc, chloroquine, ivermectin, azithromycin, paracetamol, and vitamin D are most commonly used for preventive measures and to manage symptoms related to COVID-19[7]. Additionally, herbal foods or items such as tea, ginger, black seed, cinnamon, garlic, lemon, black pepper, honey, clove, cardamom, bay leaf, and tulsi are used as preventive measures against COVID-19[15,16]. Antiviral medications such as ribavirin, remdesivir, lopinavir/ritonavir, antibiotics including azithromycin and doxycycline, and anti-parasite treatments like ivermectin have been recommended for COVID-19 management[10,17]. There is substantial evidence to suggest that people self-medicate with antibiotics like azithromycin (AZM), a macrolide that is commonly used to combat community-acquired pneumonia and sexually transmitted diseases. Antimalarials notably chloroquine (CQ) and hydroxychloroquine (HCQ), which are known to be effective in the prevention and management of COVID-19, are also frequently used for self-medication[18]. As a result of its abuse and misuse during the COVID-19

period, hydroxychloroquine is now in limited supply. Ivermectin is one of the medications that is misused or abused for COVID-19 self-medication[19,20]. Vitamins and minerals are crucial immunostimulants and antioxidants that aid in the repair of damaged cells as well as the stimulation of healing[21,22]. They are used as therapeutic agents in many diseases and disorders[23]. One of the most commonly self-medicated vitamins is vitamin C or ascorbic acid[24]. Vitamin C boosts the immune system and assists the body in fighting off foreign invaders[25]. Furthermore, due to its ability to improve innate and adaptive immunity during a viral infection, self-medication with additional minerals such as zinc (Zn) is being used in the prevention and treatment of COVID-19 symptoms[26]. In Bangladesh, Pakistan, and India, some spices including garlic, cinnamon, turmeric, ginger, black pepper, and honey have all been observed to be used as COVID-19 home remedies[15,24]. There is no reliable evidence that herbal products can cure or prevent COVID-19. But they may help boost a person's immunity and keep COVID-19 symptoms at bay[27,28]. When a person consumes any substance to treat an ailment without consultation with a physician, it is defined as self-medication, which can be detrimental to health because of inappropriate consumption. The present study aims to estimate the extent of self-medication among Bangladeshi people in the current COVID-19 scenario, as well as the factors that influence it.

# METHODS

## Study Design

An online poll of the general public in Bangladesh was used to conduct cross-sectional research. The research was carried out in accordance with the CHERRIES (Checklist for Reporting Results of Internet E-Surveys) standards[29]. The following conditions were required for participation: (i) being Bangladeshi, (ii) being willing to participate, (iii) giving electronic informed consent, (iv) being under the age of 18 years, and (v) being able to comprehend Bengali and residing in Bangladesh throughout the survey. Given the lockdown situation, an online convenience sampling method was selected to meet the study's objectives since a face-to-face interview was deemed too dangerous.

## Sample size determination

The sample size was calculated using the following equation:

$$n = \frac{z^2 pq}{d^2}$$

$$n = \frac{1.96^2 x \, 0.5 \, x \, (1-0.5)}{0.05^2}$$

$$n = 384.16 \approx 384$$

Here,

n = number of samples

z = 1.96 (95% confidence level)

p = prevalence estimate (0.5)

q = (1-p)

d = Precession of the prevalence estimate (0.05).

Here are the corrected paragraphs with grammatical and spelling adjustments:

## Study Population

Due to pandemic-related public health restrictions, potential respondents will be electronically invited through various social media platforms (e.g., Facebook, WhatsApp). A convenience sampling strategy, focused on recruiting general populations aged $\leq 15$ years living in Bangladesh during the COVID-19 pandemic, will be utilized.

## Data Collection Tool

The first page of the questionnaire included a brief introduction to the study's context, purpose, and eligibility requirements, a declaration of confidentiality and privacy, and informed consent, which asked each participant whether they wished to participate in this study. Participants would respond affirmatively to continue with the self-reporting questionnaire. The questionnaire was divided into three sections. The first section collected socio-demographic data such as participants' age group, gender, educational level, marital status, residence (rural or urban), occupation, monthly income, chronic disease status, and fear of COVID-19. The second section asked four questions about people's behavioral preventive actions, such as hand washing, staying at home except for basic needs, avoiding crowded places, and wearing masks. Participants were also asked whether their smoking habits had changed as a result of the pandemic. In the final segment, participants were asked about their use of medicines and natural products as preventive and curative treatments against COVID-19. Initially, participants were asked whether they had ever experienced any COVID-19-related symptoms. Those who had no symptoms were asked whether they had taken any medication or herbal product to reduce the risk of infection as a precaution. Those who reported one or more symptoms associated with COVID-19 were asked what medications they had used to treat them, as well as whether they had taken any pharmaceutical or herbal products as a preventive strategy before the onset of symptoms.

A list of common COVID-19 symptoms (fever, dry cough, fatigue, sore throat, trouble breathing), based on WHO recommendations, was provided with the questionnaire to assist participants in identifying COVID-19 symptoms. Participants were also asked about the information/advice that influenced their prescription and herbal product choices. The questionnaire was translated into Bengali and evaluated with 30 individuals in a pilot survey, with changes made as needed.

## Data Analysis

The participants' socio-demographic characteristics, behavioral preventive behaviors, medication and herb usage, and sources of medication-related information were all studied descriptively. The Kruskal-Wallis nonparametric test was used to detect variations in behavioral preventive measures among various demographic groups. The data and residuals were first checked for normality using Q-Q plots or the Kolmogorov-Smirnov Test. Because the data was not normally distributed, the Kruskal-Wallis test was chosen over ANOVA. Multivariable binary logistic regression was used to identify factors associated with self-medication with preventive medicines and herbal products. Hosmer and Lemeshow tests were used to justify the model's goodness of fit, and adjusted odds ratios (OR) with 95% confidence intervals (CI) were calculated. A p-value of less than 0.05 was considered significant. IBM SPSS version 22 was used to analyze the data.

## Ethical Considerations

The research was conducted in accordance with the general principles (section 12) of the Helsinki WMA Declaration. This survey-based dissertation work is also supported by the Department of Public Health and Informatics at Jahangirnagar University. No hazardous agents were used by the human participants involved in this research, and samples were not collected from them.

**Table 1:** **Frequency and percentage of socio-demographic status among the participants**

| Variable | Frequency | Percentage |
|---|---|---|
| Gender | | |
| Male | 289 | 58.5% |
| Female | 205 | 41.5% |
| Age | | |
| 15-24 | 232 | 47.0% |
| 25-34 | 169 | 34.2% |
| 35-44 | 60 | 12.1% |
| 45-54 | 20 | 4.0% |
| 55+ | 13 | 2.6% |
| Education Level | | |
| High School | 52 | 10.5% |
| College | 105 | 21.3% |
| Honors | 232 | 47.0% |
| Master's or More | 105 | 21.3% |
| Family Member | | |
| <4 | 208 | 42.1 |
| 5-6 | 221 | 44.7 |
| 7+ | 65 | 13.2 |
| Occupation | | |
| Student | 293 | 59.3 |
| Govt. Job Holder | 43 | 8.7 |
| Private Job Holder | 41 | 8.3 |
| Business | 34 | 6.9 |
| Unemployed | 38 | 7.7 |
| Housewife | 45 | 9.1 |
| Monthly Income | | |
| <10000 | 108 | 21.9 |
| 10000-20000 | 62 | 12.6 |
| 20000-30000 | 106 | 21.5 |
| 30000-40000 | 112 | 22.7 |
| 40000-50000 | 54 | 10.9 |
| 50000+ | 52 | 10.5 |
| Having Chronic Disease | | |
| No | 422 | 85.4% |
| Yes | 72 | 14.6% |
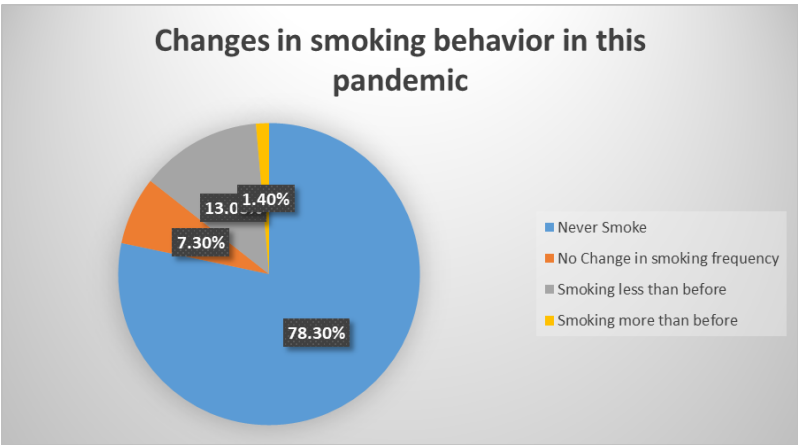
**Figure 1**: Changes in smoking behavior in Covid-19 pandemic among the participants (n=494).
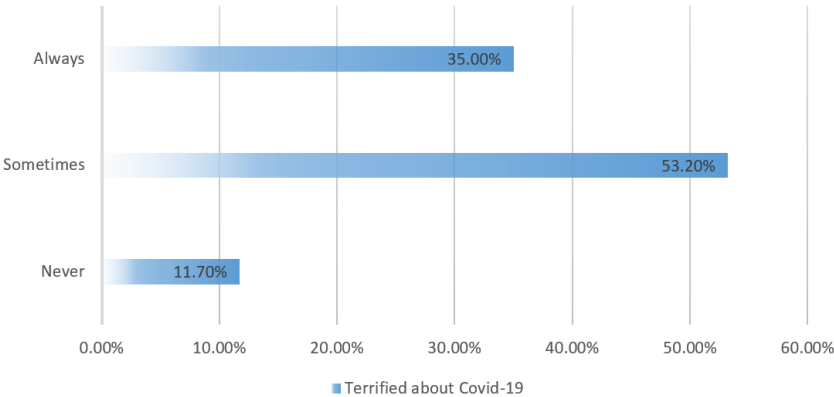


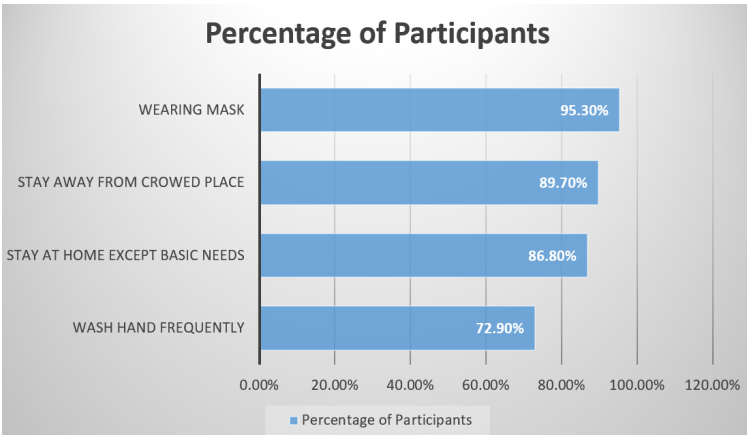**Figure 2**: Prevalence of terrified participants due to COVID-19.



**Figure 3**: Preventive behavioral practice among the participants (n=494).

**Table 2**: Differences in the number of behavioral preventive practices across various demographic groups, as measured by GroupWise means and Kruskal-Wallis test findings (n=494)

| Variable | Behavioral Preventive practice | | Kruskal Wallis/Mann Whitney value | P-value |
|---|---|---|---|---|
| | Mean | SD | | |
| Gender | | | 2.03 | 0.153 |
| Male | 3.36 | 1.03 | | |
| Female | 3.57 | 0.70 | | |
| Age | | | 7.03 | 0.130 |
| 15-24 | 3.47 | 0.89 | | |
| 25-34 | 3.50 | 0.91 | | |
| 35-44 | 3.17 | 1.08 | | |
| 45-54 | 3.09 | 0.76 | | |
| 55+ | 3.62 | 0.51 | | |
| Education Level | | | 9.83 | 0.02 |
| High School | 3.08 | 1.25 | | |
| College | 3.33 | 0.997 | | |
| Honors | 3.53 | 0.79 | | |
| Master's or More | 3.57 | 0.82 | | |
| Family Member | | | 2.50 | 0.286 |
| <4 | 3.480 | 0.90 | | |
| 5-6 | 3.479 | 0.84 | | |
| 7+ | 3.23 | 1.14 | | |
| Occupation | | | 15.13 | 0.010 |
| Student | 3.49 | 0.87 | | |
| Govt. Job Holder | 3.65 | 0.53 | | |
| Private Job Holder | 3.24 | 1.07 | | |
| Business | 2.82 | 1.31 | | |
| Unemployed | 3.53 | 0.98 | | |
| Housewife | 3.53 | 0.66 | | |
| Monthly Income | | | 3.44 | 0.633 |
| <10000 | 3.50 | 0.83 | | |
| 10000-20000 | 3.60 | 1.017 | | |
| 20000-30000 | 3.44 | 1.024 | | |
| 30000-40000 | 3.47 | 0.90 | | |
| 40000-50000 | 3.40 | 0.81 | | |
| 50000+ | 3.50 | 0.85 | | |
| Residence | | | 3.75 | 0.04 |
| Rural | 3.30 | 1.09 | | |
| Urban | 3.55 | 0.74 | | |
| Having Chronic Disease | | | .329 | 0.568 |
| No | 3.47 | .908 | | |
| Yes | 3.31 | .929 | | |
| Terrified about Covid-19 | | | 33.34 | <0.001 |
| Never | 2.66 | 1.396 | | |
| Sometimes | 3.49 | 0.85 | | |
| Always | 3.65 | 0.62 | | |
| Covid-19 related symptom | | | 3.72 | 0.054 |
| Yes | 3.37 | .90 | | |
| No | 3.48 | .92 | | |

**Figure 4**: **Percentage of taken preventive medicine as self-medication against COVID19.**



**Figure 5**: **Sources of information among the participants (n=335)**.
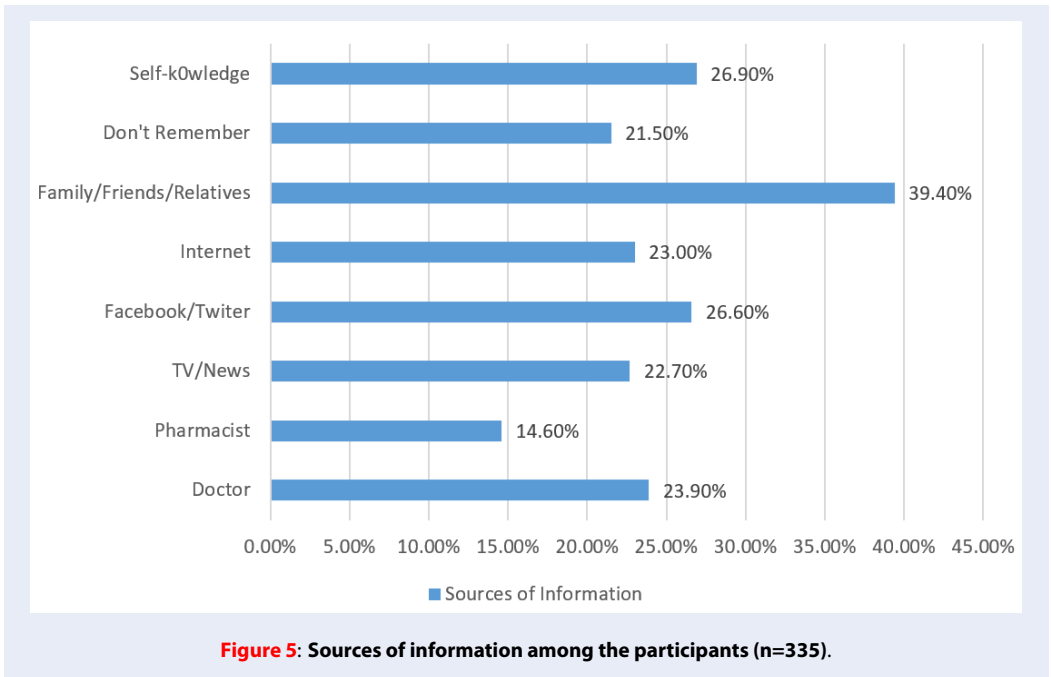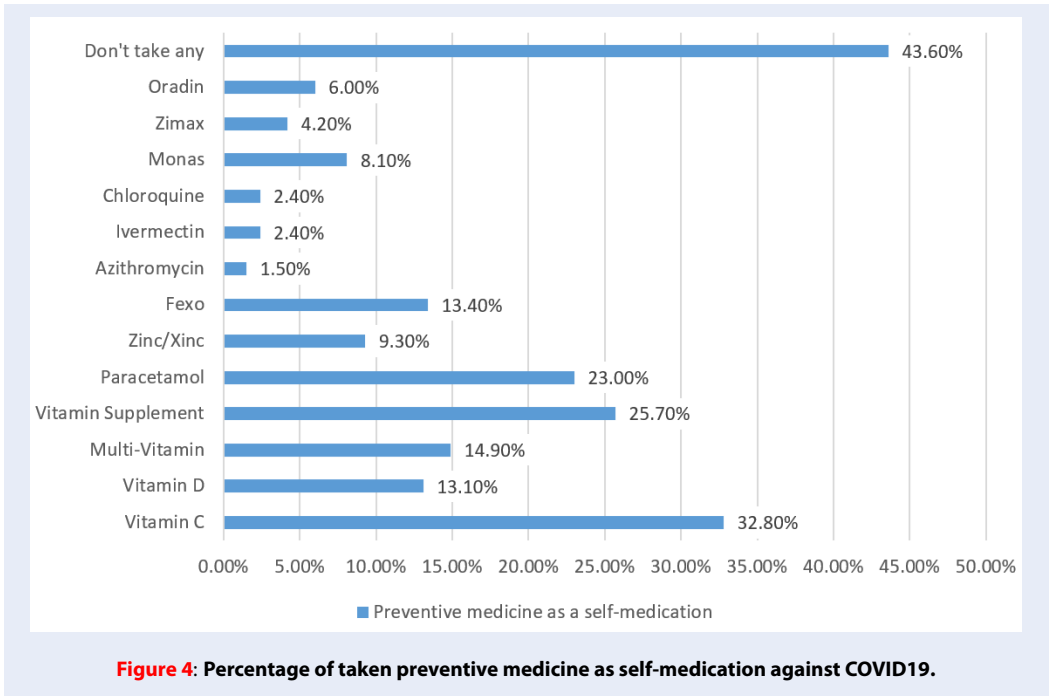
**Table 3:** Results of multivariable logistic regression of the factors associated with the taken preventive medicines and herbal products among the public as a preventive measure

| Variable | Taken preventive medicine against Covid-19 | | | Taken herbal products as preventive measures against Covid-19 | | |
|---|---|---|---|---|---|---|
| | Adjusted Odds ratios | 95% Confidence interval | P- value | Adjusted Odds ratios | 95% Confidence interval | P- value |
| **Gender** | | | | | | |
| Male | Ref | | | | | |
| Female | 1.59 | 0.90-2.79 | .108 | 0.37 | 0.18-0.75 | 0.006 |
| **Age** | | | | | | |
| 15-24 | Ref | | | | | |
| 25-34 | 2.542 | 0.44-14.66 | .296 | .450 | 0.06-3.27 | 0.430 |
| 35-44 | 2.509 | 0.47-13.55 | .285 | .994 | 0.15-6.70 | 0.995 |
| 45-54 | 1.642 | 0.31-8.77 | .562 | 1.470 | 0.20-10.69 | 0.703 |
| 55+ | 1.136 | 0.17-7.82 | .897 | .581 | 0.07-5.19 | 0.627 |
| **Education Level** | | | | | | |
| High School | Ref | | | | | |
| College | .470 | 0.17-1.28 | .139 | .223 | 0.07-0.73 | 0.013 |
| Honors | .408 | 0.18-0.94 | .036 | .433 | 0.15-1.24 | 0.118 |
| Master's or More | .455 | 0.22-0.94 | .034 | .390 | 0.15-1.02 | 0.054 |
| **Family Member** | | | | | | |
| <4 | Ref | | | | | |
| 5-6 | .58 | 0.25-1.31 | .187 | .955 | 0.39-2.31 | 0.918 |
| 7+ | .79 | 0.35-1.80 | .580 | .908 | 0.38-2.19 | 0.830 |
| **Occupation** | | | | | | |
| Student | Ref | | | | | |
| Govt. Job Holder | 1.86 | 0.63-5.45 | .259 | 2.758 | 0.77-9.93 | 0.121 |
| Private Job Holder | 1.68 | 0.44-6.37 | .449 | 4.892 | 0.81-29.41 | 0.083 |
| Business | 1.25 | 0.34-4.52 | .738 | 1.424 | 0.31-6.46 | 0.647 |
| Unemployed | 1.18 | 0.33-4.27 | .797 | 1.401 | 0.33-5.99 | 0.650 |
| Housewife | .907 | 0.24-3.43 | .886 | .664 | 0.15-2.89 | 0.586 |
| **Monthly Income** | | | | | | |
| <10000 | Ref | | | | | |
| 10000-20000 | 1.35 | 0.53-3.43 | .530 | .651 | 0.22-1.97 | 0.448 |
| 20000-30000 | 1.22 | 0.44-3.39 | .700 | .800 | 0.25-2.60 | 0.711 |
| 30000-40000 | 1.50 | 0.60-3.75 | .385 | .766 | 0.25-2.32 | 0.637 |
| 40000-50000 | 3.17 | 0.22-8.27 | .018 | 1.457 | 0.44-4.74 | 0.532 |
| 50000+ | 1.10 | 0.39-3.06 | .853 | 2.616 | 0.56-12.26 | 0.222 |
| **Residence** | | | | | | |
| Rural | Ref | | | | | |
| Urban | .48 | 0.28-0.80 | .005 | 0.83 | 0.46-1.49 | 0.531 |
| **Having Chronic Disease** | | | | | | |
| No | Ref | | | | | |
| Yes | .72 | 0.31-1.67 | .446 | 1.14 | 0.42-3.14 | 0.795 |
| **Terrified about Covid-19** | | | | | | |
| Never | Ref | | | | | |
| Sometimes | 0.31 | 0.15-0.63 | .001 | 0.41 | 0.19-0.88 | 0.022 |
| Variable | Taken preventive medicine against Covid-19 | | | Taken herbal products as preventive measures against Covid-19 | | |
| | Adjusted Odds ratios | 95% Confidence interval | P- value | Adjusted Odds ratios | 95% Confidence interval | P- value |
| Always | 0.64 | 0.39-1.06 | .081 | 0.68 | 0.38-1.23 | 0.210 |

# RESULTS

## Descriptive Statistics of Socio-demographic Variables

A total of 494 people participated in the survey. The age of the participants ranged from 15 to over 55 years. Among the respondents, 289 were male (58.5%) and 205 were female (41.5%). In terms of educational status, the majority of the participants held honors degrees (n=232, 47.0%), and there was an equal number of college and masters (or higher) degree holders (n=105, 21.3%) in this study. About 44.7% of the individuals had five to six members in their family, and 42.1% had fewer than four members. Students (n=293, 59.3%) were the major respondents in this research, and other participants included housewives (n=45, 9.1%), government job holders (n=43, 8.7%), private job holders (n=41, 8.3%), the unemployed (n=38, 7.7%), and businessmen (n=34, 6.9%), respectively. Regarding monthly income, only 10.5% of respondents earned more than 50,000 BDT, and the majority of the participants (n=112, 22.7%) earned between 30,000 and 40,000 BDT. Furthermore, 85.4% of the individuals (n=422) had no chronic diseases (**Table 1**).

## Changes in Smoking Behavior

In this study, most respondents (78.3%) reported that they never smoked. Additionally, 7.3% of individuals had no change in smoking behavior. Furthermore, 13.0% of respondents were smoking less than before, and 1.4% of participants were smoking more than before (**Figure 1**).

## Prevalence of Participants Terrified Due to COVID-19

This study indicated that approximately 53.2% of respondents were somewhat terrified about COVID-19. Additionally, COVID-19 was always a source of terror for 35% of the respondents. In contrast, COVID-19 was never terrifying to 11.7% of the respondents (**Figure 2**).

## Preventive Behavioral Practice Among the Participants

This study showed that among all the respondents, 95.3% were wearing masks, 89.7% were staying away from crowded places, 86.8% were staying at home except for basic needs, and 72.9% were frequently washing their hands (**Figure 3**).

## Differences in the Number of Behavioral Preventive Practices Across Various Demographic Groups

**Table 2** uses the Mann-Whitney U and Kruskal-Wallis H tests to evaluate differences across socio-demographic characteristics in behavioral preventive practices against the COVID-19 pandemic. The Mann-Whitney U test revealed no significant difference between the two gender groups; male and female, U=2.03, p=.153. There was also no significant difference among the five age groups, H=7.03, p=.130. However, the Kruskal-Wallis test revealed significant differences (p=.02) in the behavioral preventive practice across four levels of education. Occupation (H=15.13, p=.01) and residence (U=3.75, p=.04) groups also showed significant differences in their behavioral preventive practices. This study revealed strong significant differences among the three levels of terror regarding COVID-19 in relation to behavioral preventive practices (H=33.34, p<.001).

## Percentage of Participants Taking Preventive Medicine as Self-medication Against COVID-19

**Table 3** shows the percentage of participants taking preventive medicine as self-medication who have no COVID-19 symptoms. Among 494 participants, 335 had no COVID-19 symptoms. Of those, 43.6% (n=146) had not taken any preventive medicine against COVID-19. Most of the participants, 32.8%, used vitamin C/Ceevit as self-medication. Other preventive medicines included vitamin supplements (25.7%), vitamin D (13.1%), paracetamol (23%), Fexo (13.4%), and ivermectin (2.4%).

## Sources of Information Among the Participants (n=335)

**Figure 3** revealed the sources of information about preventive medicine and herbal products that can prevent COVID-19. Most participants received information from family members, relatives, and friends (39.4%). The internet, Facebook/Twitter, and self-knowledge were other common sources, at 23.3%, 26.6%, and 26.9%, respectively.

## Multivariable Logistic Regression of the Factors Associated with Taking Preventive Medicines and Herbal Products

Males were less likely than females to take herbal products (OR: 0.37, 95% CI: 0.18-0.75), according to regression analysis. Furthermore, individuals with
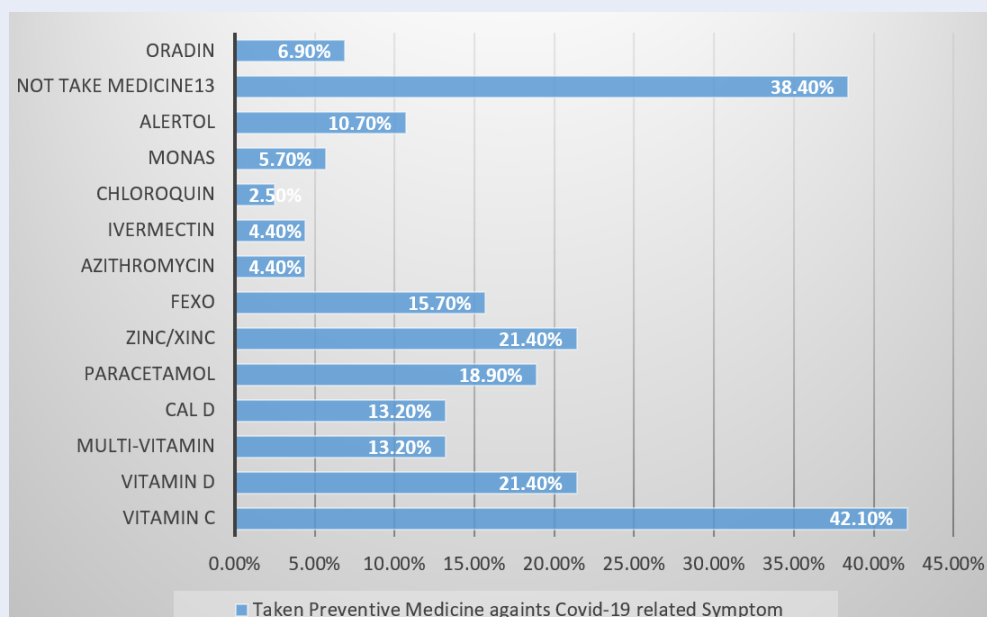
**Figure 6**: **Take medicine to manage the COVID-19 related symptoms.**

higher education, such as honors and master's degrees, were more likely than those with lower educational levels. Those who were never terrified about COVID-19 were less likely to take herbal products as preventive measures against COVID-19 (OR: 0.41, 95% CI: 0.19-0.88).

Rural participants were less likely than urban participants to take preventive medicine as a preventive measure (OR: 0.48, 95% CI: 0.28-0.80). Participants who were never terrified about COVID-19 were less likely than those who were always terrified (**Table 3**).

### Medication Taken to Manage COVID-19 Related Symptoms

Among the participants (n=159), 32.2% had COVID-19 related symptoms. The medications taken included vitamin C (42.1%), vitamin D (21.4%), Fexo (15.7%), paracetamol (18.9%), and ivermectin (4.4%).

### DISCUSSION

During the COVID-19 pandemic, self-medication and self-care have become conventional practices, given the rising acceptance of home-based administration for mild and asymptomatic cases. The main findings of the study show that out of 494 participants, 58.5% were male and 47% were in the age group of 15-24. Students made up 59.3% of the participants, with 47% having at least an honors degree and 57.6% living in urban areas. 85.4% reported having no

chronic diseases. We found that behavioral preventative strategies—such as washing hands (72.9%), staying at home except for essential requirements (86.8%), avoiding crowded places (89.7%), and wearing masks (95.3%)—were widely used. This was consistent with findings from many previous studies in Nigeria, Saudi Arabia, and Bangladesh [1,30,31]. Education level, occupation, residence, and being terrified about COVID-19 were significantly different from behavioral preventive practices (p<0.05), similar to a previous study in Bangladesh [32]. 67.8% of participants reported that they had no COVID-19-related symptoms. In our study, most participants were non-smokers (78.3%). Smoking has been linked to an increased incidence of respiratory tract infections among smokers [33], and also to the progression of COVID-19 [34]. However, many people reported an increase in smoking, which may be related to the pandemic and the heightened stress, worry, and boredom caused by the lockdown. This research shows that smoking increased by more than 1.4%, which is lower than in the previous study in Bangladesh [32].

Vitamin C, vitamin supplements, paracetamol, zinc, fexofenadine, and chloroquine were used by a large proportion of the participants as preventative medications against COVID-19. Our study shows that Vitamin C was consistently used by participants at 32.8%, which is higher than the previous study in Togo (27%) [35]. Vitamin C plays a majestic role in boosting our immune systems [23]. High dosages of vitamin

C have been helpful in the treatment of COVID-19 in many trials[36].

In our study, education level, occupation, residence, and being terrified about COVID-19 influenced the prevalence of self-medication, similar to several studies in different countries[9,24,37]. Participants with honors and master's degrees were most likely to take preventive medicine (p=0.03, 95% CI: 0.18-0.94; p=0.22, 95% CI: 0.022-0.94). Urban participants (p=0.005, 95% CI: 0.28-0.80) and those a little bit terrified about COVID-19 (p=0.001, 95% CI: 0.15-0.63) were most likely to take preventive medicine[32].

Tea/herbal tea (60.5%), lemon (58.4%), ginger (44.6%), black seed (34.7%), and honey (24.9%) were the most commonly used by participants as preventive measures against COVID-19. Indigenous medicinal treatments are available to help strengthen a person's immunity and alleviate COVID-19 symptoms[15]. Gender, education level, monthly income, residence, and being terrified about COVID-19 have a significant association with taking herbal products as a preventive measure. Females were more likely to use herbal products (p=0.006, 95% CI: 0.18-0.75). Family/friends/relatives were the main sources of information for 39.4% of participants.

There are several limitations to this study. Firstly, this study employed a cross-sectional design, which makes drawing causal inferences difficult. Secondly, data was collected using self-reporting interviews rather than face-to-face interviews, which are prone to social desirability and declarative memory biases. Thirdly, an online survey with a convenience sample was distributed through the researchers' networks and various social media sites (Facebook, WhatsApp). Fourthly, vulnerable populations such as the elderly, the poor, and the illiterate were not included in this research. Consequently, the survey's scope was limited, and the results are unlikely to be representative of the general population. The exclusion of vulnerable people who may not have internet access means there is a risk of bias; thus, the survey is unlikely to provide an accurate representation of the entire Bangladeshi population. Lastly, some respondents may have selected response options at random to complete the survey quickly, or they may have looked up answers while filling out the forms. These factors were not accounted for in our research, and they could have affected the results.

## CONCLUSIONS

Self-medication is a common practice in various countries around the world, where individuals use or choose medicines to treat self-identified illnesses, symptoms, or health challenges without consulting a physician. Such practices can lead to health risks, including antimicrobial resistance. In Bangladesh, self-medication is prevalent as it offers a low-cost alternative for people. This often involves the inappropriate and injudicious use of medicines to treat self-recognized symptoms. The World Health Organization (WHO) does not recommend any medicine that can act as a preventive drug for COVID-19. Nevertheless, people in different areas of the world are consuming drugs as self-medication to prevent or alleviate COVID-19 or to boost the immune system against the virus. Self-care measures, such as behavioral preventive practices and restricted use of herbal remedies, may be more beneficial than self-medication with preventative medicines in reducing the occurrence of COVID-19.

## ABBREVIATIONS

**AZM** - Azithromycin, **BDT** - Bangladeshi Taka (currency), **CHERRIES** - Checklist for Reporting Results of Internet E-Surveys, **CI** - Confidence Interval, **CQ** - Chloroquine, **COVID-19** - Coronavirus Disease 2019, **HCQ** - Hydroxychloroquine, **OR** - Odds Ratio, **SARS-CoV-2** - Severe Acute Respiratory Syndrome Coronavirus 2, **WHO**- World Health Organization, **Zn** - Zinc

## ACKNOWLEDGMENTS

## AUTHOR'S CONTRIBUTIONS

All authors read and approved the final manuscript.

## FUNDING

## AVAILABILITY OF DATA AND MATERIALS

Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Institutional Research Ethics and Human Involvement Guidelines (Helsinki declaration) were followed in the study. The human subjects that took part in this study did not utilize any hazardous substances, nor were any samples taken from them. Additionally,

the Department of Public Health and Informatics at Jahangirnagar University has supported this survey-based research.

## CONSENT FOR PUBLICATION

Not applicable.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

## REFERENCES

1. Banik R, Rahman M, Sikder MT, Rahman QM, Pranta MUR. Knowledge, attitudes, and practices related to the COVID-19 pandemic among Bangladeshi youth: a web-based cross-sectional analysis. Journal of Public Health (Germany). 2021;31:9–19. Available from: https://doi.org/10.1007/s10389-020-01432-7.

2. World Health Organization. (2021). WHO-convened Global Study of Origins of SARS-CoV-2 : China Part (14 January-10 February 2021). Joint WHO-China Study Team Report, (February), 120.

3. Worldometer. (n.d.). Bangladesh Coronavirus Cases. Retrieved from 9 aug 2021 website: https://www.worldometers.info/coronavirus/country/bangladesh/.

4. 제목없음. (n.d.). 제목 없음 제목없음 제목없음 제목No Title.

5. WHO. (1998). WHO_DAP_98.13.pdf.; 1998.

6. Martínez M, Luis EO, Oliveros EY, Fernández-Berrocal P, Sarrionandia A, Vidaurreta M. Validity and reliability of the Self-Care Activities Screening Scale (SASS-14) during COVID-19 lockdown. Health and Quality of Life Outcomes. 2021;19(1):1–12. PMID: 33388064. Available from: https://doi.org/10.1186/s12955-020-01607-6.

7. Quispe-Cañari JF, Fidel-Rosales E, Manrique D, Mascaró-Zan J, Huamán-Castillón KM, Chamorro-Espinoza SE. Self-medication practices during the COVID-19 pandemic among the adult population in Peru: A cross-sectional survey. Saudi Pharmaceutical Journal. 2021;29(1):1–11. PMID: 33519270. Available from: https://doi.org/10.1016/j.jsps.2020.12.001.

8. Nasir M, Chowdhury AS, Zahan T. Self-medication during COVID-19 outbreak: a cross sectional online survey in Dhaka city. International Journal of Basic and Clinical Pharmacology. 2020;9(9):1325. Available from: https://doi.org/10.18203/2319-2003.ijbcp20203522.

9. Zeru N, Fetene D, Geberu DM, Melesse AW, Atnafu A. Self-medication practice and associated factors among university of gondar college of medicine and health sciences students: A cross-sectional study. Patient Preference and Adherence. 2020;14:1779–90. PMID: 33061320. Available from: https://doi.org/10.2147/PPA.S274634.

10. Foundation, T. I. (2008). Guidelines on clinical management of Thalassaemia. (November). Retrieved from http://www.thalassaemia.org.cy/; 2008.

11. Eurosurveillance Editorial Team. (2020). Note from the editors: World Health Organization declares novel coronavirus (2019-nCoV) sixth public health emergency of international concern. Euro Surveillance : Bulletin Europeen Sur Les Maladies Transmissibles = European Communicable Disease Bulletin, 25(5), 2019–2020. https://doi.org/10.2807/1560-7917.ES.2020.25.5.200131e; 2020.

12. Makowska M, Boguszewski R, Nowakowski M, Podkowińska M. Self-Medication-Related Behaviors and Poland's COVID-19 Lockdown. International Journal of Environmental Research and Public Health. 2020;17(22):8344. PMID: 33187315. Available from: https://doi.org/10.3390/ijerph17228344.

13. Dhaheri ASA, Bataineh MF, Mohamad MN, Ajab A, Marzouqi AA, Jarrar AH, et al. mpact of COVID-19 on mental health and quality of life: Is there any effect? A crosssectional study of the MENA region. PLoS ONE. 2021;16(3):1–17. Available from: https://doi.org/10.1371/journal.pone.0249107.

14. Mudenda S, Witika BA, Sadiq MJ, Banda M, Mfune RL, Daka V. Self-medication and its Consequences during &amp;amp; after the Coronavirus Disease 2019 (COVID-19) Pandemic: A Global Health Problem. European Journal of Environment and Public Health. 2020;5(1). Available from: https://doi.org/10.29333/ejeph/9308.

15. Nur M, Azam K, Mahamud RA, Hasan A, Jahan R, Rahmatullah M. Some home remedies used for treatment of COVID-19 in Bangladesh. Journal of Medicinal Plants Studies. 2020;8(4):27–32.

16. Silveira D, Prieto-Garcia JM, Boylan F, Estrada O, Fonseca-Bazzo YM, Jamal CM. COVID-19: Is There Evidence for the Use of Herbal Medicines as Adjuvant Symptomatic Therapy? Frontiers in Pharmacology. 2020;11(September). PMID: 33071794. Available from: https://doi.org/10.3389/fphar.2020.581840.

17. Kaggwa MM, Bongomin F, Najjuka SM, Rukundo GZ, Ashaba S. Cannabis-induced mania following covid-19 self-medication: A wake-up call to improve community awareness. International Medical Case Reports Journal. 2021;14:121–5. PMID: 33658866. Available from: https://doi.org/10.2147/IMCRJ.S301246.

18. Hunter J, Arentz S, Goldenberg J, Yang G, Beardsley J, Mertz D. Rapid review protocol: zinc for the prevention or treatment of COVID-19 and other coronavirus-related respiratory tract infections. Integrative Medicine Research. 2020;9(3). PMID: 32690999. Available from: https://doi.org/10.1016/j.imr.2020.100457.

19. Molento MB. COVID-19 and the rush for self-medication and self-dosing with ivermectin: A word of caution. One Health. 2020;10(June). PMID: 32632377. Available from: https://doi.org/10.1016/j.onehlt.2020.100148.

20. Popp M, Stegemann M, Metzendorf MI, Kranke P, Meybohm P, Skoetz N, et al. Ivermectin for preventing and treating COVID-19. Cochrane Database of Systematic Reviews, 2021(4). 2021;4:CD015017. Available from: https://doi.org/10.1002/14651858.CD015017.

21. Lukaski HC. Vitamin and mineral status: effects on physical performance. Nutrition (Burbank, Los Angeles County, Calif). 2004;20(7-8):632–44. PMID: 15212745. Available from: https://doi.org/10.1016/j.nut.2004.04.001.

22. Michos ED, Cainzos-Achirica M. Supplements for the Treatment of Mild COVID-19-Challenging Health Beliefs With Science From A to Z. JAMA Network Open. 2021;4(2). PMID: 33576814. Available from: https://doi.org/10.1001/jamanetworkopen.2021.0431.

23. Kumar P, Kumar M, Bedi O, Gupta M, Kumar S, Jaiswal G. Role of vitamins and minerals as immunity boosters in COVID-19. Inflammopharmacology. 2021;29(4):1001–16. PMID: 34110533. Available from: https://doi.org/10.1007/s10787-021-00826-7.

24. Wegbom AI, Edet CK, Raimi O, Fagbamigbe AF, Kiri VA. Self-Medication Practices and Associated Factors in the Prevention and/or Treatment of COVID-19 Virus: A Population-Based Survey in Nigeria. Frontiers in Public Health. 2021;9(June). PMID: 34150693. Available from: https://doi.org/10.3389/fpubh.2021.606801.

25. Chambial S, Dwivedi S, Shukla KK, John PJ, Sharma P. Vitamin C in disease prevention and cure: an overview. Indian Journal of Clinical Biochemistry. 2013;28(4):314–28. PMID: 24426232. Available from: https://doi.org/10.1007/s12291-013-0375-3.

26. Kumar A, Kubota Y, Chernov M, Kasuya H. Potential role of zinc supplementation in prophylaxis and treatment of COVID-19. Medical Hypotheses. 2020;144. PMID: 32512490. Available from: https://doi.org/10.1016/j.mehy.2020.109848.

27. Huang J, Tao G, Liu J, Cai J, Huang Z, Chen JX. Current Prevention of COVID-19: Natural Products and Herbal Medicine. Frontiers in Pharmacology. 2020;11(October). PMID: 33178026. Available from: https://doi.org/10.3389/fphar.2020.588508.

28. Khadka D, Dhamala MK, Li F, Aryal PC, Magar PR, Bhatta S. The use of medicinal plants to prevent COVID-19 in Nepal. Journal of Ethnobiology and Ethnomedicine. 2021;17(1):26. PMID: 33832492. Available from: https://doi.org/10.1186/s13002-021-00449-w.

29. Eysenbach G, Street E. Checklist for Reporting Results of Internet E-Surveys (CHERRIES). 1–5.; 2004.

30. Alrasheedy AA, Abdulsalim S, Farooqui M, Alsahali S, Godman B. Knowledge, attitude and practice about coronavirus disease (Covid-19) pandemic and its psychological impact on students and their studies: A cross-sectional study among pharmacy students in Saudi Arabia. Risk Management and Healthcare Policy. 2021;14:729–41. PMID: 33654441. Available from: https://doi.org/10.2147/RMHP.S292354.

31. Habib MA, Dayyab FM, Iliyasu G, Habib AG. Knowledge, attitude and practice survey of COVID-19 pandemic in Northern Nigeria. PLoS ONE. 2021;16(1):1–12. Available from: https://doi.org/10.1371/journal.pone.0245176.

32. Ahmed I, Hasan M, Akter R, Sarkar BK, Rahman M, Sarker MS, et al. Behavioral preventive measures and the use of medicines and herbal products among the public in response to Covid-19 in Bangladesh: A cross-sectional study. PLoS ONE. 2020;15(12):1–12. Available from: https://doi.org/10.1371/journal.pone.0243706.

33. Jiang C, Chen Q, Xie M. Smoking increases the risk of infectious diseases: A narrative review. Tobacco Induced Diseases. 2020;18(July):60. PMID: 32765200. Available from: https://doi.org/10.18332/tid/123845.

34. Mohsin FM, Tonmon TT, Nahrin R, Tithy SA, Ame FA, Ara I. Association Between Smoking and COVID-19 Severity: evidence from Bangladesh. Journal of Multidisciplinary Healthcare. 2021;14(June):1923–33. PMID: 34326643. Available from: https://doi.org/10.2147/jmdh.s317603.

35. Sadio A, Gbeasor-Komlanvi F. Assessment of self-medication practices in the context of COVID-19 outbreak in Togo. BMC public health. 2021;21:58. Available from: https://doi.org/10.21203/rs.3.rs-42598/v1.

36. Updated, L. (2021). Last Updated: February 11, 2021. 293–302.; 2021.

37. Moonajilin MS, Mamun MA, Rahman ME, Mahmud MF, Mamun AHA, Rana MS. Prevalence and drivers of self-medication practices among savar residents in Bangladesh: A cross-sectional study. Risk Management and Healthcare Policy. 2020;13:743–52. PMID: 32753987. Available from: https://doi.org/10.2147/RMHP.S256272.